



High energy density lithium ion batteries with reduced first cycle irreversibility

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Abstract:

Qatar Environment & Energy Research Institute QEERI-HBKU mission is to accelerate the adaptation of solar energy in Qatar by developing new materials and systems for solar and energy storage. Energy storage systems offer technical solutions to buffer the intermittent character of solar energy. Electrochemical systems are the best option to store electricity in term of price, performance and maintenance. Among them, QEERI is focusing on lithium ion, sodium, sulfur and flow batteries. Each technology has its own performance characteristics that it is optimal for certain on (or off) grid applications and less for others. This talk will explore QEERI recent activities in energy storage and especially in lithium ion batteries. As discovery and development of new cathode materials remains an important challenge, recent studies have shown that it is not easy to increase the energy density of lithium ion cell without reducing the first cycle irreversibility of promising anodes such as silicon and tin based materials. We will present our recent work on using Li_2O as a lithium sources to overcome the first cycle irreversibility of a silicon alloys based anode. Moreover, the mechanism behind its activation in lithium ion cell will be discussed. This mechanism could also explain the abnormal charge capacity observed for high-capacity layered, lithium-rich oxide cathode materials [1].

[1] A. Abouimrane, Y. Cui, Z. Chen, I. Belharouak, H. B Yahia, H. Wu, R. Assary, L. A Curtiss, K. Amine *Nano Energy* 27 (2016)196-201.

Contribution:

Invited